

CLAIMS

1. Use of colourless colloidal preparations of titanium dioxide or of one to its precursors, for the conservation of the original appearance of cementitious, stone, or marble products, by the application of said preparations on the surfaces of the above-mentioned products.
2. Use of preparations according to Claim 1 containing a metal ion chosen from groups I-VA, and the lanthanide or actinide series of the periodic table, and mixtures thereof.
3. Use of preparations according to Claim 2 containing a metal ion selected from the group consisting of lithium, beryllium, magnesium, scandium, yttrium, lanthanum, cerium, niobium, vanadium, zirconium, and mixtures thereof.
4. Use of preparations according to Claim 3 containing ions selected from the group consisting of magnesium, cerium, niobium, and lanthanum.
5. Use of preparations according to Claim 2 containing the metal ion in an amount of from 0.1 to 5% (percentage expressed as metal-ion atoms with respect to the titanium atoms).
6. Use of preparations according to Claim 5 containing the metal ion in an amount of from 0.1 to 1%.
7. Use of preparations according to Claim 1 in which the titanium dioxide is prevalently in the form of anatase.
8. Use of preparations according to Claim 7 in which at least 75% of titanium dioxide is in the form of anatase.
9. Use of preparations according to Claim 1 in which the titanium-dioxide precursor is a product able to produce titanium dioxide prevalently in the form of anatase.
10. Use of preparations according to Claim 9 in which the titanium-dioxide precursor is a product able to produce titanium dioxide prevalently in the form of anatase with appropriate types of thermal treatment.
11. Use of preparations according to Claim 9 in which the titanium-dioxide precursor is chosen from the group comprising TiCl_4 , TiOSO_4 , and titanium alkoxide.
12. Use of preparations according to Claim 1 for the oxidation of polluting

substances chosen from the group comprising organic substances present in the environment as a result of motor-vehicle exhaust or industrial emissions, and inorganic compounds.

- 5 13. Use of preparations according to Claim 12 for the oxidation of nitrogen oxides (NO_x).
14. Use of preparations according to Claim 1 in which the titanium dioxide in colloidal form is prepared using sol-gel techniques so as to obtain particles having a size of between 10 and 200 Å.
- 10 15. Use of preparations according to Claim 14 in which the particles of titanium dioxide have a size of between 50 and 100 Å.
16. Use of preparations according to Claim 1 in an aqueous suspension which is applied on the product in small successive amounts until the desired thickness is reached.
- 15 17. Use of preparations according to Claim 1 in which the colloidal suspension is vacuum-dried so as to obtain a powder which can be re-suspended in water, maintaining its colloidal properties.
18. A method for preserving the original appearance of cementitious, stone, or marble product from the action of atmospheric agents, characterized in that the surfaces of said products are treated with colourless colloidal preparations of
- 20 titanium dioxide or one of its precursors.
19. A method according to Claim 18, in which the preparations of titanium dioxide or one of its precursors contain a metal ion chosen from the groups I-VA, and the lanthanide or actinide series of the periodic table, and mixtures thereof.
- 25 20. A method according to Claim 19, in which the preparations of titanium dioxide or one of its precursors contain a metal ion selected from the group consisting of lithium, beryllium, magnesium, scandium, yttrium, lanthanum, cerium, niobium, vanadium, zirconium, and mixtures thereof.
- 30 21. A method according to Claim 20, in which the preparations of titanium dioxide or one of its precursors contain ions selected from the group consisting of magnesium, cerium, niobium, and lanthanum.
22. A method according to Claim 19, in which the preparations of titanium dioxide or one of its precursors contain the metal ion in an amount of from 0.1 to 5%

(percentage expressed as metal-ion atoms with respect to the titanium atoms).

23.A method according to Claim 22, in which the preparations of titanium dioxide or one of its precursors contain the metal ion in an amount of from 0.1 to 1%.

24.A method according to Claim 18, in which the titanium dioxide is prevalently in the form of anatase.

25.A method according to Claim 24, in which at least 75% of titanium dioxide is in the form of anatase.

26.A method according to Claim 18, in which the titanium-dioxide precursor is a product able to produce titanium dioxide prevalently in the form of anatase.

27.A method according to Claim 26, in which the titanium-dioxide precursor is a product able to produce titanium dioxide prevalently in the form of anatase with appropriate types of thermal treatment.

28.A method according to Claim 26, in which the titanium-dioxide precursor is chosen from the group comprising TiCl_4 , TiOSO_4 , and titanium alkoxide.

29.A method according to Claim 18, for the oxidation of polluting substances chosen from the group comprising organic substances present in the environment as a result of motor-vehicle exhaust or industrial emissions, and inorganic compounds.

30.A method according to Claim 29, for the oxidation of nitrogen oxides (NO_x).

31.A method according to Claim 18, in which the titanium dioxide in colloidal form is prepared using sol-gel techniques so as to obtain particles having a size of between 10 and 200 Å.

32.A method according to Claim 32, in which the particles of titanium dioxide have a size of between 50 and 100 Å.

33.A method according to Claim 18, in which an aqueous suspension of the colloidal preparation of titanium dioxide or one of its precursors is applied on the product in small successive amounts until the desired thickness is reached.

34.A method according to Claim 33, in which the colloidal preparation is vacuum-dried so as to obtain a powder which can be re-suspended in water, maintaining its colloidal properties.

35.A cementitious, stone, or marble product, characterized in that it is coated with a colloidal preparation of titanium dioxide or one of its precursors.

36. A cementitious, stone, or marble product according to Claim 35, in which a preparation of titanium dioxide or one of its precursors contains a metal ion chosen from groups I-VA, and the lanthanide or actinide series of the periodic table, and mixtures thereof.
- 5 37. A cementitious, stone, or marble product according to Claim 36, in which a preparation of titanium dioxide or one of its precursors contains a metal ion selected from the group consisting of lithium, beryllium, magnesium, scandium, yttrium, lanthanum, cerium, niobium, vanadium, zirconium, and mixtures thereof.
- 10 38. A cementitious, stone, or marble product according to Claim 37, in which a preparation of titanium dioxide or one of its precursors contains ions selected from the group consisting of magnesium, cerium, niobium, and lanthanum.
39. A cementitious, stone, or marble product according to Claim 36, in which a preparation of titanium dioxide or one of its precursors contains the metal ion in
15 an amount of from 0.1 to 5% (percentage expressed as metal-ion atoms with respect to the titanium atoms).
40. A cementitious, stone, or marble product according to Claim 39, in which a preparation of titanium dioxide or one of its precursors contains the metal ion in an amount of from 0.1 to 1%.
- 20 41. A cementitious, stone, or marble product according to Claim 35, in which the titanium dioxide is prevalently in the form of anatase.
42. A cementitious, stone, or marble product according to Claim 41, in which at least 75% of titanium dioxide is in the form of anatase.
43. A cementitious, stone, or marble product according to Claim 35, in which the
25 titanium-dioxide precursor is a product able to produce titanium dioxide prevalently in the form of anatase.
44. A cementitious, stone, or marble product according to Claim 43, in which the titanium-dioxide precursor is a product able to produce titanium dioxide prevalently in the form of anatase with appropriate types of thermal treatment.
- 30 45. A cementitious, stone, or marble product according to Claim 43, in which the titanium-dioxide precursor is chosen from the group comprising TiCl_4 , TiOSO_4 , and titanium alkoxide.

46. A cementitious, stone, or marble product according to Claim 35, in which a preparation of titanium dioxide or one of its precursors has the function of oxidant for polluting substances chosen from the group comprising organic substances present in the environment as a result of motor-vehicle exhaust or industrial emissions, and inorganic compounds.

47. A cementitious, stone, or marble product according to Claim 46, in which a preparation of titanium dioxide or one of its precursors has the function of oxidant for nitrogen oxides (NO_x).

48. A cementitious, stone, or marble product according to Claim 35, in which the titanium dioxide in colloidal form is prepared using sol-gel techniques so as to obtain particles having a size of between 10 and 200 Å.

49. A cementitious, stone, or marble product according to Claim 48, in which the particles of titanium dioxide have a size of between 50 and 100 Å.

50. A cementitious, stone, or marble product according to Claim 35, in which an aqueous suspension of the colloidal preparation of titanium dioxide or one of its precursors is applied on the product in small successive amounts until the desired thickness is reached.

51. A cementitious, stone or marble product according to Claim 35, in which the colloidal suspension of titanium dioxide or one of its precursors is vacuum-dried so as to obtain a powder which can be re-suspended in water, maintaining its colloidal properties.

52. A process for the creation of colourless colloidal preparations of titanium dioxide or of one to its precursors containing a metal ion chosen from groups I-VA, and the lanthanide or actinide series of the periodic table, and mixtures thereof, characterized in that the hydrolysis of the titanium dioxide precursors takes place directly in the presence of the salt of the metal ion by co-precipitation or mixing and characterized in that the metal ion is present in an amount of from 0.1 to 5% (percentage expressed as metal-ion atoms with respect to the titanium atoms).

53. A process according to Claim 52, characterized in that the metal ion is chosen from groups I-VA, and the lanthanide or actinide series of the periodic table, and mixtures thereof.

- 54.A process according to Claim 53, characterized in that the metal ion is selected from the group consisting of lithium, beryllium, magnesium, scandium, yttrium, lanthanum, cerium, niobium, vanadium, zirconium, and mixtures thereof.
- 55.A process according to Claim 54, characterized in that the ions are selected from the group consisting of magnesium, cerium, niobium, and lanthanum.
- 56.A process according to Claim 52, characterized in that the metal ion is present in an amount of from 0.1 to 1%.
- 57.A process according to Claim 52, characterized in that the titanium dioxide is prevalently in the form of anatase.
- 58.A process according to Claim 57, characterized in that at least 75% of titanium dioxide is in the form of anatase.
- 59.A process according to Claim 52, characterized in that the titanium-dioxide precursor is a product able to produce titanium dioxide prevalently in the form of anatase.
- 60.A process according to Claim 59, characterized in that the titanium-dioxide precursor is a product able to produce titanium dioxide prevalently in the form of anatase with appropriate types of thermal treatment.
- 61.A process according to Claim 59, characterized in that the titanium-dioxide precursor is chosen from the group comprising TiCl_4 , TiOSO_4 , and titanium alkoxide.

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